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Binary neutron star mergers in massive scalar-tensor theory: post-merger properties and gravitational wave signature

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We study binary neutron stars in the framework of Damour-Esposito-Farese-type scalar-tensor theory of gravity with a massive scalar field using numerical relativity simulations, focusing on the properties of post-merger remnant. We found that the threshold mass for prompt collapse is raised in the presence of the excited scalar field. Our simulation results also suggest the existence of long-lived ϕ–mode in hypermassive neutron stars due to the presence of the massive scalar field which enhances the quasi-radial oscillation in the remnant. We investigate the descalarization condition in hypermassive neutron stars and discover a distinctive signature in post-merger gravitational waves.

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